v. 15 #1

The MONTHLY REVIEW

Published Monthly by the

American Electroplaters Society

A SOCIETY FOR THE ADVANCEMENT

OF THE

SCIENCE OF ELECTROPLATING

JANUARY, 1928

KRESGE-HOOKER SCIENTIFIC LIBRARY
WAYNE UNIVERSITY

Entered as second-class matter September 3, 1924, at the Post Office of Chicago, Ill., under act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 3, 1926.

EXECUTIVE BOARD OFFICERS, A. E. S., 1927-1928

President
John H. Feeley, 411 Aylmer St., Montreal, Quebec, Can.
First Vice-President
Horace Smith, 208 N. Third St., Newark, N. J.
Second Vice-President
E. W. Heil, 1724 Jackson Ave., Wichita, Kans.
Secretary-Treasurer
George Gehling, 5001 Edmund St., Philadelphia, Pa.
Past President
F. C. Mesle, Box 465, Sherrill, N. Y.

Editor
F. J. Hanlon, 3040 Diversey Ave., Chicago, Ill.
Associate Editors
Dr. Wm. Blum, Bureau of Standards, Washington, D. C.
O. E. Servis, 5305 Warner Ave., Chicago, Ill.
W. S. Barrows, 628 Dovercourt Rd., Toronto, Canada

Publishing Committee
George B. Hogaboom, Chairman, 269 Oliver St., Newark, N. J.
Wm. R. J. Kennedy, 27 Ringold St., Springfield, Mass.
E. W. Heil, 1724 Jackson Ave., Wichita, Kans.
O. J. Sizelove, Newark, N. J.
Walter Fraine, Dayton, Ohio

Research Committee

R. J. O'Connor, Chairman, 1128 Noble Ave.,	Bridgeport, Conn.
Phil Sieverling, Treasurer, 20 So. Crescent,	Maplewood, N. Y.
C. E. Van Deran	Mansfield, Ohio
S. E. Hedden	Pittsburg, Ohio
Geo. B. Hogaboom	Newark, N. J.
F. J. Hanlon	Chicago, Ill.

1927-1928 Prize Award Papers

Dr. Wm. Blum, Chairman	Washington, D. C.
S. P. Gartland	Rochester Branch
Walter Fraine	Dayton Branch
H. Der Doest	Cleveland Branch
F. J. Hanlon	Chicago Branch

NOTICE—BRANCH SECRETARIES

Do not neglect to get Manufacturers Lists for Supreme Secretary that everybody will receive Convention data.

MONTHLY REVIEW

Published by the

American Electroplaters Society

Publication and Editorial Office
3040 Diversey Ave., Chicago

VOL. XIV JANUARY, 1928 No. 12

EDITORIAL

This being the first month of the new year, in which many of our members have much spare time and many of the boys go ahunting for pleasure and profit, some in the wilderness of the forests for the Easter bunnies, and some in the public libraries for the hidden secrets of KNOWLEDGE. Others hunt in the Plating rooms for the year's mistakes and ways to correct them. The writer suggests a few of the following thoughts to the members hoping to overcome the sights, of Crepe, Mortgages and Chilblains, the usual rewards of HUNTERS partially equipped.

When starting out to hunt, whether it be for game or knowledge or mistakes in the Plating room, the first thing to know is WHAT you are hunting for. This requires EXPERIENCE. And to be able to bag the game we must also have a knowledge of the Tools required by the HUNTER.

In the Parlance of DAD LISCOMB, we see two (2) hunters. Both have the tools and the knowledge about hunting. The big fellow has a gun as good as the little fellow has and both work side by side in the Plating room and talk hunting in many of their idle moments. The little fellow frequently went after Mr. Rabbit, but the big fellow only talked about it. So one day, after much bickering, they both decided to hunt together.

So they loaded their guns and took the dogs and went into the field where the rabbits were numerous—and BANG went the little fellow's gun, and a nice juicy rabbit for Sunday dinner was the result and again spoke the gun of the little fellow and another rabbit bit the snow. As no sound had come from the big fellow's

gun we scurried across the field to find out the reason and there we find the big fellow filling his pipe and the rabbits sliding by to try and dodge the little fellow's gun (of observation or investigation) and the rabbits (or opportunities) not only going, but GONE.

To the little fellow's inquiry of why didn't you shoot, the intelligent comeback was "Well, I am waiting for him to sit up." And as Dad would say, "There you are."

Now, brother hunters in the plating industry, why be fearful that the high school boy with his chemistry, and the polisher that has ambitions to fit himself for the job of plater. If when hunting with the gun of knowledge backed up with the experience that is yours, and the many experiences of our members as published in our REVIEW which is yours also to improve upon, and preserve your game preserve from poachers. Somewhere the writer saw a slang expression, the coat and pants do all the work but the vest gets all the gravy. Why not put on the VEST of Study and Knowledge and get all the GRAVY.

Dear members, you may think that the day of the experienced plater executive is on the wane, but on the contrary it is just commencing and his VALUE is on the increase with each day, but the time has come when "HE must KNOW."

ANODES FOR CHROMIUM PLATING

Address to American Electro-Platers Society and American Electrochemical Society, at Detroit, Dec. 14, 1927
By Dr. O. P. Watts, Wisconsin University

Several weeks ago I received a telegram asking if I would come to Detroit and speak at this meeting on anodes for chromium plating. I had made two brief visits to Detroit in as many years and wanted to come again, extend my all-too-slight acquaintance with its gigantic industries, and get further inspiration to continue research in my two chosen lines, electroplating, and the corrosion and protection of metals and alloys. You who live here cannot possibly feel the stimulus which an outsider gets on coming into this atmosphere of accomplishment, where more progress is made in industry in a year than occurs elsewhere in ten years. Of course I wire "Yes."

At the outset I want it understood that in chromium plating I am only a laboratory worker, who never saw any commercial

chromium plating except the plating of two radiator shells, an exhibit which a friend staged for me here in Detroit on one of the visits to which I have referred. So I am here, not as an expert on chromium plating, but as I see it, merely to introduce that important subject for a general discussion, which will constitute the really valuable part of the evening's program.

The experiments which I shall report were all made with the chromic acid solution, and all statements are to be understood as applying to that solution only. If I may digress from the announced topic of anodes, I should like first to discuss chromium deposition. The chromic acid solution is peculiar both in its constitution and in its operation. Its constitution is peculiar in that the solution is a powerful oxidizing agent, and that nearly all chromium is hexavalent, less than one per cent being in the trivalent form, to which it is believed that hexavalent chromium must be reduced before it can be deposited as metal. The chromic acid solution is peculiar in operation in that a tremendous current density must be maintained at every point where chromium is to be deposited, and that the throwing power is far poorer than that of any other plating solution. The effect of valence in electrodeposition is simple. The common valence for metals is 1, 2 and 3, these numbers indicating the relative amounts of electricity carried by one atom of any metal having that valence. It therefore requires twice as much electric current to deposit at the cathode or to dissolve from an anode one atom of a divalent metal as is required for one atom of a mono-valent metal (valence = 1.), and so for other valences. A few metals can exist in solution with more than one valence, e. g., iron, chromium and copper. One way of changing the valence of such metals in solution is to add electric charges at the anode or to take them away (reduce the valence) at the cathode. Such action uses up electric current just as dissolving metal from an anode or depositing it at a cathode does. For a metal to dissolve at an anode each atom entering solution must be given a number of electric charges equal to its valence, and when it is deposited it must give up to the cathode the same electric charges. This is merely one way of stating Faraday's law.

In Sargent's solution, which I used, there were 32 ounces of chromium tri-oxide in which chromium has a valence of six, and only half an ounce of chromium sulphate, in which chromium has a valence of three. Let us speculate on what probably happens

when current is passed through this solution. In doing this I am only expressing my opinions, based on the general principles of electrolysis, and not stating facts proved by experiments and analysis of this solution. The action is similar to that of a solution of ferric chloride, where iron has the higher of its two valences, three, instead of the valence two, as in ferrous salts. Many years ago I directed a student to electrolyze a solution of 13 oz. per gallon of ferric chloride at 10 amperes per square foot with iron electrodes. He found corrosion of the anode to greatly exceed 100 per cent, and instead of a gain in weight for the cathode, it actually lost weight, i. e., the efficiency of deposition was less than zero. At the cathode the entire current was spent in reducing the iron from the ferric to the ferrous state (changing its valence from three to two), so no iron could be deposited. In addition the cathode was corroded by the ferric chloride solution just as would have happened to any sheet of iron hung in the solution without any electric connection. At the anode the efficiency of the electrolytic corrosion was 100 per cent, and added to this was the corrosive action of the ferric chloride, which goes on whether current is passing or not.

Had a much larger current been used, iron would have been deposited, but this would occur only when the ferric chloride in the film touching the cathode had been reduced to ferrous, and its corrosive action thus stopped. If, when the current density is just high enough to cause deposition of iron, a mechanical stirrer be introduced, corrosion instead of deposition will result. The stirring brings in from the main body of solution so much ferric chloride that once more all current is used up in reducing this, and no iron is deposited.

At the anode iron dissolves as ferrous chloride, so that with continued operation the concentration of ferrous chloride increases and that of ferric chloride diminishes, the efficiency of deposition increases, and of anode corrosion diminishes, until each becomes 100 per cent. If the soluble iron anode be replaced by a large insoluble carbon anode, metal no longer enters the solution, but ferrous chloride that, by natural circulation or by stirring comes into contact with the anode, is changed to the ferric state. Any current left over after this is accomplished, evolves chlorine at the anode.

If two carbon electrodes are placed close together in a fairly concentrated solution containing about equal quantities of ferrous

and ferric chlorides, a very considerable current can pass without any deposition of either metal or hydrogen at the cathode, or evolution of chlorine at the anode. At the cathode the entire current is spent in reducing the ferric iron to ferrous, and at the anode it is employed in raising the valence of the ferrous iron from two to three. The same action will occur even if the electrodes are far apart, provided a mechanical stirrer is used to prevent exhaustion of ferric chloride at the cathode and of ferrous chloride at the anode.

Now let us turn to the chromium plating solution. Here we have a concentrated solution with practically all the chromium in the state of highest valence, six. We should expect no deposition of metal until nearly all chromium in the film in contact with the cathode has been reduced to the lower valence, so at low and moderate current densities no deposit of metal can be looked for. But why the hydrogen, that deposits as soon as the current density has become high enough to deposit metal? It is like the hydrogen that is deposited along with nickel when a small addition of sulphuric acid is made to the nickel bath. Chromium trioxide (CrO_3) is the anhydride of chromic acid (H_2Cr_4), just as sulphur trioxide (SO_3) is the anhydride of sulphuric acid (H_2SO_4). The reaction of each anhydride with a single molecule of water (H_2O), forms the acid. Just as the sulphuric acid supplies hydrogen to be plated out along with the nickel, so the chromic acid supplies hydrogen to deposit with the chromium. The more sulphuric acid added to the nickel solution the more hydrogen and the less nickel there is deposited.

Faraday's law is that at both anode and cathode a total of chemical changes must occur equivalent to the current, and no exception to this is known. Three different changes are going on at the same time at the cathode in a chromium plating solution, reduction of the valence of chromium from six to three, deposition of hydrogen, and deposition of metal. The sum total of these accounts for the whole current flowing. If with a constant current we increase the amount of any one of these changes, one or both of the other changes must necessarily be diminished. This principle is beautifully shown when plating with cadmium from cyanide solution. At low current density no hydrogen accompanies deposition of metal, i. e., the efficiency is 100 per cent. Increase the current and hydrogen begins to be deposited along with cadmium, because in each second of time there is not enough

cadmium brought by diffusion into contact with the cathode for this larger current to be entirely occupied in depositing cadmium; so the deficiency in cadmium has to be made up by deposition of the only other substance that can be deposited at cathodes from this solution, viz., hydrogen. Now bob the cathode up and down in the solution as if you were fishing for cod. The evolution of hydrogen ceases. You are continually moving the cathode into fresh solution where there is plenty of metal to carry all current to the cathode, so hydrogen is no longer deposited, and the efficiency of metal deposition is 100 per cent even at the higher current.

This is what is accomplished by "motion planting," long used in the deposition of silver, in order that a weak solution of this precious metal may be made to deposit silver as fast, without burning, as a much stronger still solution can do. Whenever so much current is driven through a solution that there is not enough metal in contact with the cathode at all times to carry the whole current to the cathode, the balance of the current deposits hydrogen. The only exception to this is where a part of all the current may be used in the reduction of some metal in the solution from a high to a lower valence, as pointed out for ferric chloride and the chromic acid solution.

At the anode similarly, all current not employed in dissolving metal or in raising the valence of metal already in solution (what chemists call oxidizing the metal to a higher valence), evolves oxygen, chlorine, etc., depending on the solution.

It is evident why motion of the cathode or stirring the solution can entirely prevent the deposition of chromium, as you know it does, unless you increase the current at the same time that you stir the solution. The motion brings into contact with the cathode enough chromic acid so that the entire current is used in reducing this to a lower valence, and consequently there is no deposition of chromium. The higher the temperature, the higher must be the current density to secure any deposition of chromium. Why? Because rise of temperature lowers viscosity, and so increases the rate of natural diffusion of all dissolved substances; this, like gentle stirring, brings the high-valence chromium to the cathode faster than before. A high current density is thus required in order that, after all this extra chromic acid has been reduced, some current may still be left over to deposit chromium.

It is on the same principle that you warm the nickel and cyanide

copper solutions, to allow the use of an extra high current density. Burning occurs because there is not enough metal in the film of solution touching the cathode, and not, as some people erroneously think, because hydrogen is evolved. As previously explained, evolution of hydrogen is often an indication that there is a lack of sufficient metal at the cathode, hence it is not strange that some should have mistaken a symptom for the cause of the disease. Heating accelerates diffusion, and thus brings into the cathode from the main body of solution enough extra metal so that the current density, and hence the speed of plating may be increased without burning. Hydrogen in chromium plating indicates how much current is wasted in depositing a substance that is useless, except as it may serve as a tenuous hook on which to hang patents. It is worse than a waste, for it causes vigorous stirring at the cathode surface, where stirring has the greatest effect in diminishing the efficiency of chromium deposition. Anything that cuts down the liberation of hydrogen will therefore have a double effect in increasing the efficiency of deposition of chromium.

Anodes

My remarks on anodes for chromium plating are based on small-scale experiments in the laboratory, run 24 hours a day, with electrode removal only at long intervals. Since the solutions were covered, the loss by spray was negligible, and because of the infrequent removal of cathodes, the solution carried out on these was but a small fraction of that so lost in commercial plating. As a result of these differences commercial solutions need replenishing with chromic acid sooner than mine, and the injurious effects which resulted from the use of most anode materials will be slower to appear in commercial solutions, since a considerable part of the anode products are carried out with the solution lost.

As commonly used in plating solution anodes serve two distinct purposes. They lead in and distribute current to the articles to be plated, and also supply metal to replace that which is deposited. Practice in chromium plating has differed from the normal in the use of anodes only to distribute current, the metal taken from the solution being replaced by additions of chromic acid at suitable intervals. There have been two reasons for this: First, the difficulty of obtaining chromium anodes; second, the greater cost of supplying chromium from anodes instead of by chromic acid.

So far as I have observed, the materials which have been recommended for anodes are chromium, lead, steel or iron, and sev-

KRESGE-HOOKER

eral grades of chrome steel. Of these only chromium supplies the necessary metal to the solution. Besides testing all of these and several commercial alloys noted for their resistance to corrosion, I made a few special alloys in order to find the effect of certain other elements which have been found resistant to ordinary chemical corrosion.

Chromium

The chromium anodes were free from carbon and iron, and corroded very smoothly and uniformly without the production of sludge. Efficiencies are based on a valence of six for chromium. The efficiency of deposition was 12 per cent at the start, 9.2 per cent after 48 hours, and only 2 per cent at the end of 131 hours. Were there no loss of solution the final chromium content would have been 377 per cent of what it was at the start. Besides lowering the efficiency of deposition, other effects of this tremendous gain in chromium were serious increases in the viscosity and electrical resistance of the solution. Bright deposits were no longer obtainable, and treeing on the edges of cathodes was a regular occurrence. Chromium anodes are not suitable for continued use in the chromic acid solution because chromium is dissolved so much faster than it is deposited.

Lead

The lead was coated with peroxide by use as anode in dilute sulphuric acid before placing it in the chromium solution. Electrolysis was continued for 342 hours with no addition except water, when 70 per cent of the chromium originally in the solution had been deposited. The freshly made solution had a cathode efficiency of 3.8 per cent, which rose to a maximum of 22 per cent at the end of five days, and had fallen to 12.3 per cent at the end of the test. Since current density affects the efficiency of deposition, similar effects are not to be expected unless solutions are run at about the same current density, 112 amperes per square foot. A tendency to treeing was noticed when their chromium content had become very low, and deposits were then less bright than at the start. Addition of 8 oz. of chromic acid per gallon restored the original brightness of deposit. So far as keeping the solution in good condition is concerned, lead anodes are eminently satisfactory, and in this continuous operation there was no difficulty from insulating coatings of lead chromate, which are so troublesome in the intermittent operation of commercial solutions.

Iron

The well-known passivity of iron and steel in bichromate solu-

tions would lead one to expect little or no corrosion of these materials as anode on the Sargent solution. Both steel and Armco iron anodes became covered with a brown coating, presumably manganese dioxide from the manganese which they contained, and were very slowly corroded. The efficiency of corrosion diminished with time, falling from 2.4 per cent at the start to 0.3 per cent at the end of 340 hours. The average rate of corrosion was 0.0084 grams per ampere hour. After continued use of the iron anode several injurious effects were noted: the rate of deposition was only seven-tenths that from a similar solution with lead anodes, the resistance was doubled, a brownish film very difficult of removal formed over the chromium plate, and the tendency to treeing was greater than with lead anodes. As a result of the higher resistance the temperature of the solution was higher by 180° F. than when the anode was lead. This difference in temperature is undoubtedly partly responsible for the lower efficiency of deposition found in this solution.

Because of the greater loss of solution by spray and by drip from articles plated, these effects of iron or steel anodes will be much slower to appear in commercial plating solutions. If the amount of solution carried out on "the work" is extremely great because of large surfaces plated and extremely short period of plating, it is conceivable that the iron content might never reach the harmful concentration. I would like to have reports on *whether* or *not* the above effects of steel anodes have been observed, with the volume of solution, period of plating, and how long the solution has been in use.

Silicon-Iron

Duriron, an iron-silicon alloy containing about 15 per cent of silicon, is noted for its resistance to corrosion. An alloy of 16 per cent of silicon with pure iron was made. This lost 0.0135 grams per ampere hour, about twice the corrosion of steel.

Nickel

Like iron, nickel tends to become passive in oxidizing solutions, hence it was thought that this might prove more satisfactory than iron, for any nickel which might dissolve should not cut down efficiency of deposition of chromium by using up current in changes of valence at anode and cathode, as iron does. For a period of 130 hours the rate of corrosion was 0.0624 grams per ampere hour, entirely too great for service as anode. The deposits of chromium soon became worthless.

Ferrochromium

Chrome steel, especially that of high chromium content, has often been recommended for anodes. Commercial ferrochromium, probably about 64 per cent chromium, quickly spoiled the deposit and the solution.

Stainless Steel

Stainless steel (13 per cent chromium and 0.3 per cent carbon) corroded at the high rate of 0.43 grams per ampere hour, and is a failure as anode. Chromium is a distinctly harmful ingredient of steel for use as anode in chromium plating.

Nichrome

The nickel-chromium alloys are esteemed for their resistance to corrosion by acids, so a strip of such alloy (20%Cr) was tried. This lost 0.66 grams per ampere hour, over double the loss of pure chromium, and 16 times the rate of deposition of chromium. This alloy proved an utter failure as anode, and it is probable that any addition of chromium to nickel only makes it worse as an anode, as for iron.

The unexpected and freaky behavior of the chromium plating solution in deposition, with which you are doubtless, to your sorrow, acquainted, extends to its corrosion of anodes, for in it many materials of great reputation for resistance to acids have failed utterly as anodes. The choice of anode material seems to lie between lead, with its habit of becoming coated with insulating lead chromate, and steel, which may bring about premature spoiling of the plating solution. It is a choice between two evils. * * * At the last minute I have a report from Dr. Becker of the Vacuum Can Co. that in the complete absence of sulphate, chloride, fluoride, etc., the ions which destroy passivity and promote corrosion of iron and steel anodes have been operated for four months without visible corrosion, and that no iron is found in solution. If this promise is confirmed by further experience steel will undoubtedly replace lead completely as an anode material.

PAPER ON RESEARCH, DEVELOPMENT AND STANDARDIZATION OF FINISHING PROCESSES AND METHODS

Presented by C. VanDerau

Annual Convention of American Electro-Platers' Society, Toledo, Ohio, July 1, 1927

Up to the last few years, electro-plating and finishing has been known as more or less of an art, being done by skilled craftsmen.

With the demand for increased production and lower costs by the manufacturer, it is absolutely necessary for the electro-plater or finisher to give the problems of research and standardization serious thought.

Without research it is impossible to set up intelligent standards so the problems of research and standardization are in reality the same, research being the forerunner of standardization.

Research many times is confused with invention, or the compounding of new formulas.

It is true that research may lead to these results, but it is based on a study of fundamentals that we have proven by our past experience.

With a very small outlay it is possible for the electro-plater to secure equipment, such as chemicals and apparatus, for making simple tests that can be recorded for reference and observation to determine the different variables that are responsible for plating troubles.

When the electro-plater learns the methods of plating solution analysis, and is governed in the control of his plating solutions by analysis, he begins to recognize the fact that variations, excessive costs and defective plating or finishing, are caused by failure to follow closely a process which is known to give correct results.

At the Westinghouse Electric and Mfg. Company's plant at Mansfield, Ohio, cost reduction over a period of five years has been from 50 to 75 per cent by closely following a process of research, development and standardization of finishing processes in the various finishing departments.

Factors that are given consideration are equipment, tools, processes, labor, production and costs. As specific plating solution formulas and methods of control are vital to the above factors, this paper will confine itself to plating problems.

Solution standards are set by the cut and try method to determine the ideal maximum and minimum working limits.

After limits have been determined, for plating solutions, they are numbered and posted on analysis charts large enough to record one year's data. Solutions are analyzed weekly and compared with set standard to determine whether proper additions of chemicals are being made.

Variations and defective plating are generally caused by failure to keep solutions to a fixed standard. In a short time and with an average amount of work, passing through each tank, it is

possible to collect sufficient data, and make required additions of chemicals daily.

Charts are used for rapid calculations for additions of chemicals.

It will be noted that analysis chart refers only to important factors of plating solution as we maintain a card record for all plating, cleaners, pickles and oxidizing solutions, which gives the complete record of formula, chemical additions, and amount of anodes used; as well as number of times solutions are filtered or renewed, as in the case of cleaners, pickles and oxidizing solutions.

In case of experimental work, on new formulas (as for example, hydrogen peroxide against ammonium hydroxide for a neutralizing agent in nickel solutions), a test solution is made up and results carefully checked, with existing standards, to determine the desirability of making any changes.

This prevents disorganizing regular production, thereby eliminating possible rejections during experimental period.

With the above methods of solution control, variables are quickly overcome by careful thought and experimentation, thus encouraging development according to its relative importance in a systematic way.

Development projects are grouped, charted, and progress recorded periodically on a percentage basis, to familiarize and stimulate interested parties.

Methods and various plating processes are studied and written into finishing process specifications to which are assigned finishing process numbers, that are used by Engineering, Manufacturing, and Inspection departments for specifying finishes desired.

Expense materials entering into these processes are specified and carefully checked, thus tending to maintain a high quality of incoming materials. All parts are plated on plating racks that are standardized and drawn up on standard sheets. These sheets are always referred to at time of ordering; thus, becoming the specification for the builder.

Labor operations are standardized and closely studied to eliminate unnecessary motions, and operations on parts that have been assigned standard style numbers, used for identification.

After the above study, time limits are set for each operation and posted in Master Routing Books.

Each operation is given an operation number which is used as a basis of costs by Accounting Department.

Any operation performed, other than called for on route sheets, is flagged up for immediate action, by being placed on an average report.

A set of curves is used to record actual performance against our set standards. In this way we are able to quickly determine wherein we are falling short of the set standards, and remedy our defects.

When methods similar to the above are in general use, we will have truly changed Electro-Plating from an art to a science.

C. VAN DERAU,
Supervisor of Finishes.

NOTICE FROM PUBLISHING COMMITTEE

The branches will kindly act upon the request of the Chairman, Mr. George B. Hogaboom, sent them in letter form, and return their replies to him personally, that he may get the suggestions in form and at a no distant date publish a Review with the many suggestions, as answered by the branches in complete form. So do not defer this matter but get replies back to Chairman Hogaboom as soon as possible. This all requires time and any delays mean setting back the program of the Publishing Committee, set for your interest before the Convention.

CHICAGO BRANCH

The regular order of business being concluded, the Librarian took charge of the meeting and the following questions were found in the question box:

Ques. 1. What is a good black oxidizing solution for nickel solution?

Ans. 1. Hiposulphite of soda and acetate of lead used hot, or hiposulphite of soda 4 oz., nickel sulphate 4 oz., muriatic acid 4 oz., use hot.

Ques. 2. Is there any other dip, other than the regular Bright dip, that can be used to bright dip copper and brass?

Ans. 2. There were several dips given, but the Librarian was not satisfied with the answers given and ordered the question held open.

Ques. 3. What causes Verde Antique to peel off after it is perfectly dry?

Ans. 3. Work not thoroughly clean, too much solution used, solution used too strong.

PITTSBURGH BRANCH

Our meeting of Saturday evening, December 3rd, was well attended, and it seems that the special speakers we are having to address us are bringing results, although some of the older members still fight shy of the first Saturday of the month. This meeting was given over to Mr. William M. Pierce, Research Division of the New Jersey Zinc Company, Palmerton, Pa. Mr. Pierce made it known that he was not a Plater, but wanted to talk upon the uses of Zinc and its advantages over all other metals to protect Iron and Steel articles from rusting. This talk was instructive as well as very interesting, and I know our members went away with more knowledge of the uses of Zinc. Mr. Pierce is an able speaker, and held the attention of all, and to judge from the questions asked, his subject was appreciated. A vote of thanks was tendered him, and he said that he would be glad to come back again, at some future meeting.

Application of Mr. B. V. McBride, M. & P. Eng. Dept., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for membership as an associate member was received.

With regular business attended to, meeting adjourned to January 7, 1928, at which time we will have as our speaker, Mr. C. M. Hoff, Research Division, Grasselli Chemical Co., his subject will be "Cadmium: Electrodeposition for Rust-proofing Purposes," and will give the members an opportunity of learning some more.

Yours very truly,

S. E. HEDDEN, Secy.

NEWARK BRANCH

Our October 21st meeting was well attended, 26 members being present. President Chas. Bohler in the chair. On Friday evening, December 2nd, a "Ladies' Night" will be held instead of the regular

meeting. The committee in charge have assured us that a good time will be had by all who attend.

It was moved and seconded that we hold our banquet in April, 1928, the first Saturday after Easter Sunday. Mr. Sizelove gave a report on the chemistry class, which is meeting on Monday and Thursday evenings in the Essex County Vocational School.

The Librarian, Mr. Glickenhaus, read an article from the "Metallurgical and Chemical Engineering" magazine on "Acid Sludge," which is added to pickling baths to eliminate fumes. Chromium deposition was discussed as usual, and adjournment took place at 10:10 p. m.

ROYAL F. CLARK, Secy.-Treas.

ROCHESTER BRANCH

Rochester Branch meets the third Friday of each month at the Hotel Powers. In order to create interest in our meetings and have a subject for discussion, President Lopez has invited the members to select a meeting night on which they will have on display the samples of plating and finishing which they are called upon each working day to produce for the company by whom they are employed. In order to get off to a good start President Lopez and Mr. Clarence Reama at our regular meeting, October 21st, had a sample case full of buckles finished in a variety of colors. It was a very beautiful sight to see the trays after they were placed on the display table. Both the exhibitors were kept busy answering the many questions put to them as to how they had accomplished the task to produce such splendid results. At our regular meeting, November 18th, Mr. A. Cameron had a fine exhibit of special finished thermometers. It was a surprise to the members to learn the large number of special finishes required by the sales manager of a large industrial plant.

Rochester Branch has a number of out-of-town members, and to one and all we send our best wishes for a Happy and Prosperous New Year.

S. P. GARTLAND,
Secy. of Rochester Branch.

CHICAGO BRANCH

Chicago Branch held its regular meeting Saturday, January 14, at Atlantic Hotel.

Meeting was called to order by President Meyers and the attendance was very good. Everyone was anxious to get the final report from the Banquet Committee before the big night.

After the regular routine of business and the election and the initiation of candidates, the meeting was taken over by the Librarian, who found the following questions in the question box:

Ques. 1—How can you get a bright or sheen finish on hot rolled steel that has a satin finish caused from sand tumbling before nickel plating?

Ans. 1—Scratch brush before plating, ball burnish or tumble wet or dry.

Ques. 2—What causes copper to blister very easily if work is properly

cleaned? Does it lack the proper amount of cyanide or metal?

Ans. 2—If it is a cold solution it indicates too much cyanide; if it is a hot solution it indicates the lack of cyanide.

Ques. 3—What is the best anode to use in a double nickel salts solution, 95-97, 99 or 99 plus per cent?

Ans. 3—95-97 per cent was thought best.

Ques. 4—What effects would the Electric Cleaner, Cyanide, Nickel Solution, and hot water have on composition rubber seat of valves if nickel plated after assemble.

Ans. 4—Hot water, no effects; cyanide dip, no effects; nickel solution, slight effect, and the Electric Cleaner would be very harmful.

Ques. 5—How can water stains be overcome on steel after pickeling work passes through drying oven before Japanning? Trouble started since chlorine is put into water supply.

Ans. 5—Rinse in weak solution of Whale Oil soap, or Benzole or use 13 Tri-Sodium Phosphate to 10 gallons of water.

Ques. 6—What advantage is air agitation in nickel plating?

Ans. 6—Depends entirely on class of work; helps to keep solution uniform. Solution must be continuously filtered for best results; also air has a tendency to run the solution on the alkaline side.

Ques. 7—What is the best method of removing oil that has been carbonized from welding?

Ans. 7—Use 10 per cent solution of hot muriatic acid, saturated solution of alum or wash in Benzole. Pickel in hot muriatic acid then blow off scale with air.

Ques. 8—Will too much metal in Cadmium solution cause pitting? If not, what would cause pitting?

Ans. 8—Metal contents too high; dilute the solution.

Ques. 9—What Lacquer would be best suitable for gas heaters or oxidized brass that will stand 800 degrees F.?

Ans. 9—No Lacquer or other material known; other Branch help.

Ques. 10—If a 1200-gallon tank containing hot nickel solutions at 150 degrees F. with moving cathode starts to leak when production is going on, is there anything better than Barrium Chloride to add in order to stop the leak and not stop production?

Ans. 10—Nothing better known; calling upon other Branches for help.

President Meyers gave two formulas for matt dipping aluminum die casting:

First—Nitric acid 36 degrees, 16 parts hydrofluric acid 52 degrees 1 part.

Second—Aluminum die cast containing copper and alum, 85-83 per cent, nitric acid 8 parts, hydrofluric acid 1 part.

Chicago Branch had some very interesting samples of Chromium plating shown by one of its members which were plated on production basis and Chicago Branch wants to thank this fellow member for his unselfishness as he was ready to answer any and all questions.

It is about the finest job of Chromium plating we have seen as to throwing and uniform deposit.

BRIDGEPORT BRANCH

Meeting opened at 8:30 o'clock. The roll call of officers was read, three officers being absent. The minutes of last meeting were approved as read. Communications were read. Secretary instructed to send Mr. Gehling a letter of thanks for his quarterly reports. The letter from the Publication Committee was acted on and the Secretary was instructed to write to Mr. Hogaborn the answer to the three questions that were asked. Also the Bridgeport Branch A. E. S. has asked the following questions: (1) Should a piece of brass to be plated Chromium have an intermediate plate? (2) Is it possible to plate Chromium direct on castiron without an intermediate plate? (3) Can a Chromium solution be successfully run cold?

The Bridgeport Branch has got up a letter to send to each member asking him to fill in—why he can't attend these meetings and how can we make them more interesting so more members will attend? A motion was made and seconded that Mr. Straton have our rooms painted. A motion was made and seconded that we hold our banquet at the Stratfield Hotel, April 28, 1928. President Lancaster appointed the following committee: Mr. O'Connor, chairman; Mr. Straton, Mr. Karl, Mr. Oberender, Mr. Slattery, Mr. Kusterer, Mr. Thompson, Mr. Flaherty. The Treasurer's report was read and accepted. Meeting adjourned at 10:30 o'clock.

WILLIAM EHRENCRONA, Secy.-Treas.

WATERBURY BRANCH

The January meeting of Waterbury Branch was held at its meeting place in Garden Hall, and was presided over by Vice President Joseph Muscio. An interesting session was held and was largely attended, several members of the Bridgeport Branch and some prospective members being present. Librarian Wm. J. Gray had arranged an excellent program for the evening and for discussion the principal subject was the plating of Cadmium in its different forms. As this was the first time that this subject had been discussed by the members of the local branch to any great extent, it proved to be a popular subject.

Such questions as, what were the best methods for polishing and tumbling after plating? Were the rust preventing qualities of Cadmium reduced by depositing copper, brass and other metals in same; and was it practical to plate Cadmium over tin-plate, were asked. As but very little Cadmium plating has been done in this section until recently, satisfactory answers could not be given and it was intimated that information concerning same from the outside would be greatly appreciated. A copy of the Quaker City Platers' Reminder was received and passed around for inspection. It was the unanimous opinion that it ought to prove a big success and its mission should be emulated by the other branches if possible.

W. F. GUILFOILE.

TORONTO BRANCH

The Toronto Branch held their usual monthly meeting on Monday. December 19, the meeting being called to order at 8:30 p. m. by President John Walker; a very fair number of members being present. Chairman Mr. John Acheson and Secretary Mr. Walter Barrows of the Convention Committee, gave a detailed report of progress made and worked the members present into a state of great enthusiasm, everybody (rarin' to go) and do his bit for the going to be the greatest yet 1928 Convention. A committee composed of Mr. J. Magill, Mr. Chas. Kemish and Mr. M. Phillips was selected to organize a Euchre Social for the 27th of February.

Mr. Walter Barrows gave an amusing account of the different kinds of pitts on nickel he had seen, but said since he had used sodium perborate he had lost all sight of them. The subject for discussion at our January meeting will be "Conductivity versus Throwing Power." Wishing all the members of the A. E. S. a bright and prosperous New Year, I remain, yours truly,

J. ELLIS, Sec.-Treas.

Convention Forecasts

We plan to have five bright, instructive, interesting, educational sessions.

Exhibitors will experience no difficulty in getting goods through Canadian customs.

We have booked one good speaker and want twenty-four more. Send in your name now, then let us have title of your paper before April 1, 1928.

We are planning on a registration exceeding in numbers all previous A. E. S. conventions. There's a reason, and it isn't breakfast food, either.

We want one hundred advertisers to take space in a souvenir program which will be a volume of references you will keep for years.

The badge will be a thing of beauty and a joy for your grandchildren. Be sure you get one.

We hope to have a reasonable registration fee.

Also—A daylight trip across Lake Ontario, see Niagara Falls illuminated in colors, by night, after a baseball game in Victoria Park, and a ride on the gorge route, passing the famous Whirlpool.

Some more next time.

W. E. BARROWS, Secy.

MILWAUKEE BRANCH

The Milwaukee Branch, A. E. S., held a grand booster meeting December 8, 1927, which was well attended. It was decided to hold a banquet and educational on March 31, 1928, at the Republican House.

JOHN N. HOCK, Secy.-Treas.

PITTSBURGH BRANCH

Following is report of meeting held January 7:

Our regular monthly meeting held in the Down Town Branch Y.M.C.A., Saturday evening, January 7, was well attended and proved to be interesting all the way. We elected to associate membership Mr. Byron Victor McBride, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Secretary read a letter from Mr. George B. Hogaboom, in which he requested several answers to questions which were as follows: In order to make the Review as interesting as possible; publish all reports, it seems that the reports of some branch meetings are being left out, not a member was in favor of any "ads," and two members wished questions answered, as follows: How to Chromium Plate? This question is asked in result that each member has a rule of his own and a correct method is desired; this question by our president. Mr. Beck wants to know how to plate Stainless Steel. These questions caused considerable discussion.

At this time meeting was turned over to Mr. C. M. Hoff, of the Grasselli Chemical Co., Cleveland, Ohio, who spoke on the subject of Cadmium Plating, and we appreciated Mr. Hoff. He had the subject well in hand and was interesting to all platers present. His description of the methods of Cadmium plating poles for street lighting, where tanks twenty feet deep are being used and one of fifty feet deep is under construction, and are plated both inside and out. Questions took up a lot of time and meeting adjourned at 11 p. m., to meet February 4.

S. E. HEDDEN, Secy.

DETROIT BRANCH

Detroit Branch inaugurated its winter educational program with a dinner meeting on December 14, at which Dr. Olivia P. Watts was the speaker. There were 45 present for dinner, which was provided at the Detroit Engineering Society Clubhouse, and nearly 60 at the educational session, including a large number of guests from the membership of the Detroit Section, American Chemical Society, and the Michigan Section, American Electro chemical Society. Dr. Watts presented a paper on the very timely subject, "Anodes for Chromium Plating," the text of which will probably be published in the "Monthly Review."

The meeting is one of a series in which Detroit Branch is co-operating with allied societies in the Detroit district in bringing capable speakers on electroplating subjects.

During the short business session, the transfer of E. V. Allen, of the Chicago Branch, has been accepted by the Detroit Branch.

It was also decided to postpone our meeting for next month, to hear a talk given by Mr. Herring of the Bureau of Standards, through an invitation by the American Chemical Society.

CHAS. MASCOLA, Secy.

HARTFORD-CONNECTICUT VALLEY BRANCH

The December meeting of the Hartford-Connecticut Valley Branch was held on Monday evening, December 19, at the Springfield Chamber of Commerce on Chestnut street, Springfield, Mass.

The meeting was called to order at 8:30 by President Elwin. Minutes of previous meeting were read and approved. All bills were ordered paid. At this time, Mr. James H. Bissland, one of our oldest and most faithful members, was made an honorary member. After all business had been transacted, Mr. Karl Pitschner, Chief Chemist in the Research Department, American Chain Co., Bridgeport, Conn., spoke on "Testing for Porosity in Nickel and Chromium Plate." He gave a demonstration on various articles of both nickel and chromium which were brought by various members. Mr. Pitschner's talk was very interesting and instructive. In conclusion he was given a rising vote of thanks.

The meeting adjourned at 10:45 p. m.

VERNON GRANT, Secy.

CLEVELAND BRANCH

The Cleveland Branch of the A. E. S. held their regular monthly meeting January 7, 1928, and with Chromium Plating as the subject, and Mr. Van Deran of the Westinghouse Co., Mansfield, Ohio, as the speaker. Cleveland Branch really outdid its meeting of the month before by having a greater attendance. We certainly are going good in Cleveland just now.

And I might add that if the Society had a few more members like Mr. Van Deran, we could double our membership easily as he is one man that gives us something concrete, and not a lot of generalities that nobody can get anything out of. He even went so far as to bring up some work, and racks that it was done on, so that we would understand him, and we of Cleveland certainly enjoyed him and think a great deal of him and we might say that if Cleveland can ever do him a favor they certainly will do it, though I think he is too large a man for that. He also brought some of his men up with him. I hope we see more of him in the future, hoping we have another meeting like the past two in February, so come along, boys. H. J. TER DOEST, Secy.

PHILADELPHIA BRANCH

Philadelphia Branch held its regular monthly meeting January 6, attendance not being as good as expected. Those that stayed at home missed a rare treat in not hearing Mr. Wm. A. Chace's interesting talk on Lacquers. This surely was an instructive talk.

A rising vote of thanks was given Mr. Chace for his talk. Communication from the Publishing Committee of the Review was read. After some discussion, Philadelphia Branch is not in favor of any advertisements in the Monthly Review and suggest that a page of the Review be devoted to questions and answers.

Quarterly report of Supreme Secretary and Treasurer was read and appreciated. President Gehling wished the members a prosperous year and passed around a box of cigars. PHILIP UHL, Secy.

NEWARK BRANCH

Our first educational meeting in the New Year was held on Friday, January 6, 1928, with an attendance of 23 members and 6 visitors, President Chas. Bohler presiding. Two applications received and one elected to active membership. Banquet Committee reported progress.

A vote on the two questions submitted by the chairman of the Publication Committee resulted in favor of advertisements being carried in the "Review" and a "Question Box."

Mr. Chas. Proctor, a visitor, spoke on Chromium Chloride Solution, after which a general discussion took place on Chromium Deposition.

ROYAL F. CLARK, Secy.-Treas.

APPLICATIONS

	Branch
Geo. J. Miller, 701 Elizabeth Ave., Elizabeth, N. J.	Newark
John D. Hollund, 55 Adams St., Elizabeth, N. J.	Newark
Harry Simmons, 1325 Atlantic Ave., Brooklyn, N. Y.	New York
Elmer Petejohn, Cleveland, Ohio	Cleveland
Jacob Chaplek, 2440 Walton St., Chicago, Ill.	Chicago
Wm. L. Louis, 2100 S. 48th Court, Cicero, Ill.	Chicago

ELECTIONS

	Branch
Bernard Holgram, 83 Atlantic St., Jersey City, N. J.	Newark
John Palladino, 11 Bedford St., Newark, N. J.	Newark
Jos. Parulo, 1742—45th St., Brooklyn, N. Y.	New York
Jos. L. Dinan, Jr., 124 Penock Ave., Highland Pk., Phila.	Philadelphia
Louis H. Dworkin, 1027 Ridge Ave., Phila., Pa.	Philadelphia
Peter Sprizziri, 2122 W. Polk St., Chicago, Ill.	Chicago

TRANSFERS

	Branch
E. V. Allen from Chicago Branch to	Detroit

RESIGNATIONS

	Branch
Wm. McDonald	Detroit
O. E. Goredy	Detroit
A. E. Meyers	Pittsburgh

PUBLISHED BY ERROR AS SUSPENDED

Martin Smith	Philadelphia
Frank Collins	Philadelphia

SUSPENDED

	Branch
Joseph T. Deters, 648 Jackson St., Quincy, Ill.	St. Louis
R. Hite, 5923 Cadillac Ave., Detroit, Mich.	St. Louis
Jas. D. Waldron, 4323 Washington St., St. Louis, Mo.	St. Louis

DON'T OVERLOOK
Milwaukee Annual Banquet, March 31
Republican House

BOSTON

Regular meetings are held first Friday of each month, at 8 p. m., at the Boston Platers' Supply Co., 202 Friend St., Boston. Secretary, A. W. Garrett, 488 Quincy St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at 62 Cannon St., Room 17, Bridgeport, Conn. Secretary, Wm. Ehrencrona, 872 Hancock Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 316 S. Clark St. Secretary, S. J. C. Trapp, 1127 N. 7th St., Maywood, Ill.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty St. Secretary, Al. Yeager, 2021 Sherman Ave., Norwood, Ohio.

CLEVELAND

Meets first Saturday of each month at Hotel Winton. H. Terdoest, 380 Pioneer Ave., Akron, Ohio.

HARTFORD-CONN. VALLEY

Meets fourth Monday in each month alternately at 266 Pearl St., Hartford, Conn., and corner Broadway and Worthington St., Springfield. Secretary, Tennant Elwin, 117 Hobart St., Meriden, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Robert G. Suman, 66 Notre Dame Ave., Dayton, Ohio.

DETROIT

Meets the first Friday of each month at the Detroit Testing Laboratory, 554 Bagley Ave., Detroit. Secretary, Chas. Mascola, 2041 Beard Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Saturday of each month at the Vocational High School, 129 Bostwick Ave., N. E. Secretary, Jacob Van Dyke, 1361 Union Ave., N. E., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at Lipps Hall, 321 3d St. J. N. Hock, 1229 W. 24th St., Milwaukee, Wis.

MONTREAL

Meets last Friday of month at Office of Secretary, John H. Feelay, 411 Aylmer St., Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at Franklin Hall, 41 Franklin St., Newark, N. J., at 8 p. m. Secretary-Treasurer, Royal F. Clark, P. O. Box 201, Newark, N. J.

NEW YORK

Meets every second and fourth Fridays of each month in the World Building, Park Row, New York City, N. Y. Secretary, R. J. Liquori, 127 Vanderbilt Ave., Brooklyn, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 44 Washington St., Prov. Engineers Rooms, Providence, R. I. Secretary, J. H. Andrews, 19 Rosedale St., Providence, R. I.

ROCHESTER

Meets every third Friday of each month at the Powers Hotel. Secretary S. P. Gartland, 128 Bryan St., Rochester, N. Y.

ST. LOUIS

Meets first Friday of each month at Barr Branch Library, corner Jefferso and Lafayette Sts. Secretary, C. T. McGinley, 5312 West Florisant Ave., St Louis, Mo.

TOLEDO

Meets first Thursday of each month at Toledo Secor Hotel, corner Cherry an Page Sts. Secretary, W. W. Weiker, 2228 Middlesex Rd., Route 2, Box 635, Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Secretary, Jos. Ellis, 938 Ossington Ave., Toronto 4, Toronto, Canada.

WATERBURY

Meets every second and fourth Thursday of each month. Secretary, Wm. F. Cuilfoile, Garden Theatre Bldg., East Main St., Waterbury, Conn.